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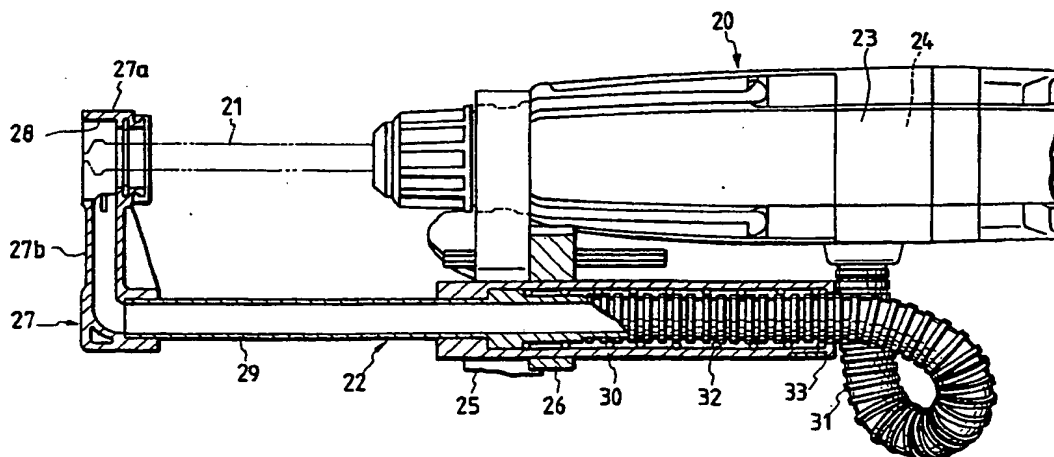
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Drill having dust collecting device.

An electric hammer drill including a vacuum dust collecting device (22) for collecting dust from an area of an article being drilled by a drill bit (21) wherein a hose (31) extending from a body (20) of the hammer drill is directly connected to an end of a movable first pipe (29) which is slidably received in a stationary second pipe (30). During a drilling operation, the first pipe (29) slides back and forth along the second pipe (30) as a suction hood (27) moves

in a direction opposite to the direction of movement of the drill bit (21). Since a sliding portion between the first and second pipes (29, 30) is separated by the hose (31) from a path of conveyance of the dust, the first pipe (29) and the hood (27) connected thereto always move smoothly relative to the drill bit (21).

FIG. 2



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DRILL HAVING DUST COLLECTING DEVICE

The present invention relates to a drill such as an electric hammer drill having a dust collecting device for collecting dust produced during a drilling operation.

One known electric hammer drill is illustrated in Figure 3. During a drilling operation using a drill bit 1, dust which is produced in the vicinity of the drill bit 1 is drawn by suction into a hood 2 of a vacuum dust collecting device. Subsequently, the dust is conveyed through a first pipe 3 connected at one end to the hood 2, through a second pipe 4 having one end slidably receiving the opposite end of the first pipe 3, and through a hose 5 having one end connected to the opposite end of the second pipe 4 and then is collected into a dust collecting chamber 6 defined in a body 7 of the hammer drill. Finally, the dust is discharged from the dust collecting chamber 6 into a dust bag (not shown) attached to the body 7. As the drilling operation proceeds, the body of the electric hammer drill moves forward. During that time, the hood 2 and the first pipe 3 retracts or moves backward. The second pipe 4 is fixedly attached to the body 7 via a side handle 9 and a holder 10. A compression coil spring 11 is disposed within the second pipe 4 and urges the first pipe 3 axially outwardly from the second pipe 4, so that the first pipe 3 is slidably movable relative to the second pipe 4 by and against the force of the spring 11.

With this construction, the dust produced during a drilling operation tends to adhere to an inner peripheral wall of the second pipe 4 and the periphery of the spring 11, thereby hindering smooth sliding movement of the first pipe 3. In the worst case, the first and second pipes 3, 4 are locked together by the dust trapped therebetween. The conventional hammer drill is, therefore, unreliable in operation. Furthermore, due to the presence of the second pipe 4 extending between the first pipe 3 and the hose 5, the flow resistance of the dust collecting device is relatively large, and air may leak from a clearance between the first and second pipes 3, 4, thus lowering the dust collecting efficiency of the dust collecting device.

With the foregoing drawbacks of the prior art in view, the present invention seeks to provide a drill having a dust collecting device which is reliable in operation and has a high dust collecting efficiency.

In brief, a drill of the present invention includes a vacuum dust collecting device for collecting dust from an area of an article being drilled by a drill bit. The dust collecting device includes a hose extending from a body of the hammer drill and directly connected to an end of a movable first pipe which is slidably received in support such as a stationary

second pipe. During a drilling operation, the first pipe slides back and forth along the support as a suction hood moves in a direction opposite to the direction of movement of the drill bit. Since a sliding portion between the first pipe and support is separated by the hose from a path of conveyance of the dust, the first pipe and the hood connected thereto always move smoothly relative to the drill bit.

According to the present invention, there is provided a drill to have a drill bit detachably connected to a body of the drill for drilling an article to be drilled, and having a vacuum dust collecting device for collecting dust from an area of the article being drilled by said drill bit, the dust collecting device including a hood to cover the periphery of the drill bit and having a suction nozzle adapted to face the area of the article being drilled, a first pipe connected at one of its opposite ends to the hood and held in fluid communication with the suction nozzle, a second pipe secured to the body, extending parallel to a longitudinal axis of the drill bit, and slidably receiving the first pipe from the opposite end of the latter, a hose extending from the body and communicating with the suction nozzle via the first pipe, and means for urging the first pipe to project outwardly from the second pipe, characterized in that the hose is directly connected to the opposite end of the first pipe.

One way of carrying out the invention is described in detail below with reference to drawings which illustrate only one specific embodiment, in which:-

Figure 1 is a schematic perspective view of an electric hammer drill having a dust collecting device according to the present invention;

Figure 2 is a fragmentary plan view, partly in cross section, of the electric hammer drill; and

Figure 3 is a fragmentary plan view, partly in cross section, of a conventional electric hammer drill having a dust collecting device.

As shown in Figure 1, an electric hammer drill embodying the invention includes a body 20 having a motor (not shown) disposed therein, a drill bit 21 releasably connected to the body 20 and driven by the motor for drilling an article made of concrete, rock and the like to be drilled, and a vacuum dust collecting device 22 for collecting dust produced from the article during a drilling operation. The body 20 includes a casing 23 (Figure 2) defining a suction chamber 24 (Figure 2) of the dust collecting device 22 in which a fan (not shown) is disposed. The fan is driven by the motor to draw air and dust suspended therein into the dust collecting chamber 24 and then discharge them from the dust

collecting chamber 24. The hammer drill further includes a side handle 25 extending laterally from the body 20 for being gripped by an operator's hand, and a clamp or holder 26 projecting laterally from the body 20 for holding a second pipe, described later, of the dust collecting device 22.

The dust collecting device 22 includes a suction hood 27 slidably movable along the drill bit 21 and circumferentially covering the drill bit 21. The suction hood 27 is composed of a hollow cylindrical body 27a having a circular suction nozzle 28 for opening to an area of the article being drilled to collect the dust produced from the drilled area, an elongate hollow wing 27b extending laterally from the cylindrical body 27a for guiding the dust from the suction nozzle 28 toward a first pipe 29. The first pipe 29, as better shown in Figure 2, is connected at one end to the wing 27b of the suction hood 27 and held in fluid communication with the suction nozzle 28. The opposite end of the first pipe 29 is slidably received in a second pipe 30. The second pipe 30 extends parallel to an longitudinal axis of the drill bit 21 and is fixedly mounted on the body 20 by means of the holder 26. While the holder 26 is loosened, the second pipe 30 is movable in a longitudinal direction to vary the initial position of the suction hood 27. The opposite end of the first pipe 29 which is received in the second pipe 30 is directly connected to one end of a flexible hose 31. The flexible hose 31 has a bellows-like structure and hence is not only flexible in any direction but expansible and contractible in a longitudinal direction. A resilient means comprised of a compression coil spring 32 (Figure 2) is disposed within the second pipe 30 and extends around a portion of the flexible hose 31 received in the second pipe 30. The compression coil spring 32 acts between the first pipe 29 and a tail cap 33 attached to an end of the second pipe 30 and urges the first pipe 29 to project outwardly from the second pipe 30. The opposite end of the flexible hose 31 is connected to a suction hole (not shown) communicating with the dust collecting chamber 24. The dust collecting chamber 24 is also communicated with a discharge hole (not shown) to which a dust bag 34 (Figure 1) is connected for collecting the dust which is suspended in air expelled from the discharge hole.

In operation, the body 20 of the electric hammer drill is thrust toward a portion of an article to be drilled. The advancing movement of the body 20 causes the suction hood 27 to engage the article in advance to the drill bit 21 being rotated. As the body 20 is further advanced, the drill bit 21 engages and then drills the article. During that time, since the drilled area is covered by the suction hood 27, dust produced from the article being drilled is drawn from the suction nozzle 28 into the

suction hood 27 and then conveyed through the first pipe 29, and through the flexible hose 31 into the dust collection chamber 24. Subsequently, the dust is discharged from the dust collecting chamber 24 into the dust bag 34. Advancing movement of the body 20 and the drill bit 21 causes the suction hood 27 to retract or move back toward the body 20. Simultaneously with this retracting movement of the suction hood 27, the first pipe 29 slides into the second pipe 30 against the force of the compression coil spring 32. Since the first pipe 29 is directly connected to the flexible hose 31, a path of conveyance of the dust is separated from a sliding portion between the first and second pipes 29, 30. Consequently, the sliding portion is always free from dust and insures smooth sliding movement of the first pipe 29 relative to the second pipe 30. Furthermore, owing to the direction connection between the first pipe 29 and the flexible hose 31, the dust conveyance path has a smaller flow resistance than that of the conventional hammer drill shown in Figure 3 and is free from leakage from a clearance between the first and second pipes 29, 30. The dust collecting device 22 of the invention has a high dust collecting efficiency.

Obviously various minor changes and modifications of the present invention are possible in the light of the above teaching. For example, the suction hood 27 and the first pipe 29 may be integral. The flexible hose 31 may be substituted by a general hose of an elastic material. The dust collecting device 22 of the invention is applicable to other appliances such as vacuum cleaners having a hose connected to a cleaning head or attachment via telescopically connected pipes. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

Claims

1. A drill to have a drill bit (21) detachably connected to a body (20) of the drill for drilling an article to be drilled, and having a vacuum dust collecting device (22) for collecting dust from an area of the article being drilled by said drill bit (21), said dust collecting device (22) including a hood (27) to cover the periphery of said drill bit (21) and having a suction nozzle (28) adapted to face the area of the article being drilled, a first pipe (29) connected at one of its opposite ends to said hood (27) and held in fluid communication with said suction nozzle (28), a second pipe (30) secured to said body (20), extending parallel to a longitudinal axis of said drill bit (21), and slidably receiving said first pipe (29) from the opposite end of the latter, a hose (31) extending from said body (20) and com-

municating with said suction nozzle (28) via said first pipe (29), and resilient means (32) for urging said first pipe (29) to project outwardly from said second pipe (30), characterized in that said hose (31) is directly connected to said opposite end of said first pipe (29). 5

2. A drill to have a drill bit (21) detachably connected to a body (20) of the drill for drilling an article to be drilled, and having a vacuum dust collecting device (22) for collecting dust from an area of the article being drilled by said drill bit (21), said dust collecting device (22) including a hood (27) to cover the periphery of said drill bit (21) with a suction nozzle (28) adapted to face the area of the article being drilled, a pipe (29) connected at one end to said hood (27) and in fluid communication with said suction nozzle (28), support means (30) secured to said body (20) and supporting said first pipe (29) to be slidable parallel to the axis of the drill bit, a hose (31) extending from said body (20), communicating with said suction nozzle (28) via said first pipe (29), and resilient means (32) for urging said first pipe (29) to project outwardly from said support means (30), characterized in that said hose (31) is directly connected to the opposite end of said first pipe (29) from said one end. 10 15 20 25

3. A drill according to claim 1 or 2 wherein said resilient means (32) comprises a compression coil spring disposed within said support or second pipe (30) and extending around a portion of said hose (31) received therein. 30

4. A drill according to claim 1, 2 or 3 wherein said hose (31) is expansible and contractible in a longitudinal direction.

5. A drill according to any preceding claim wherein said hose (31) is a flexible hose. 35

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FIG. 1

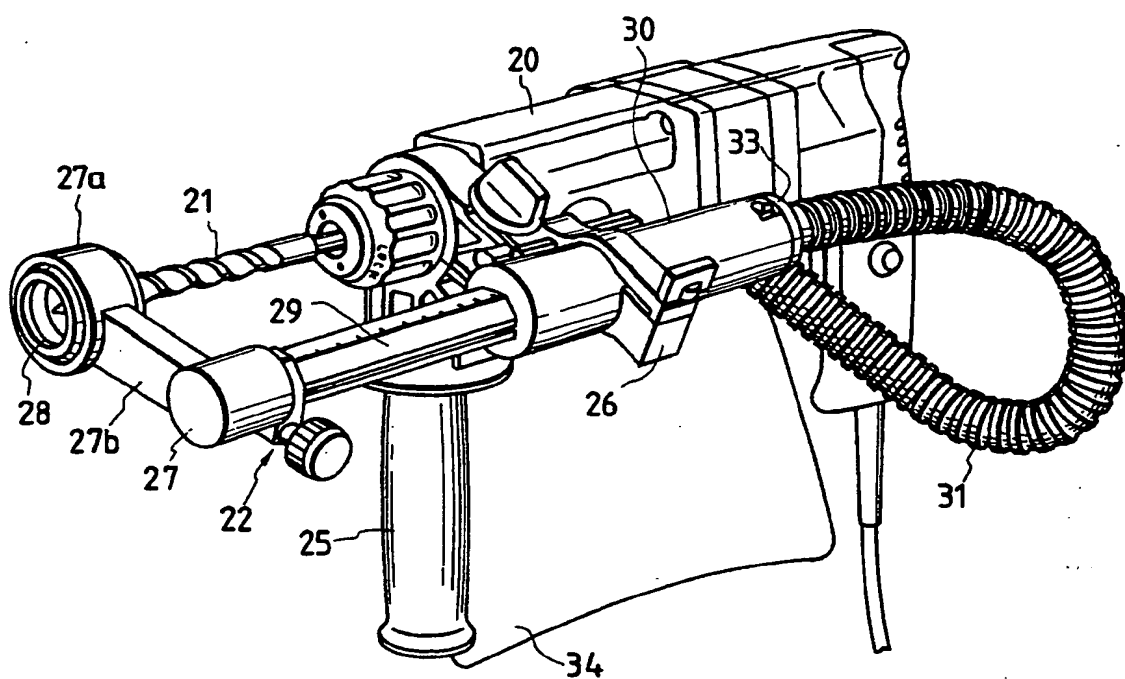


FIG. 2

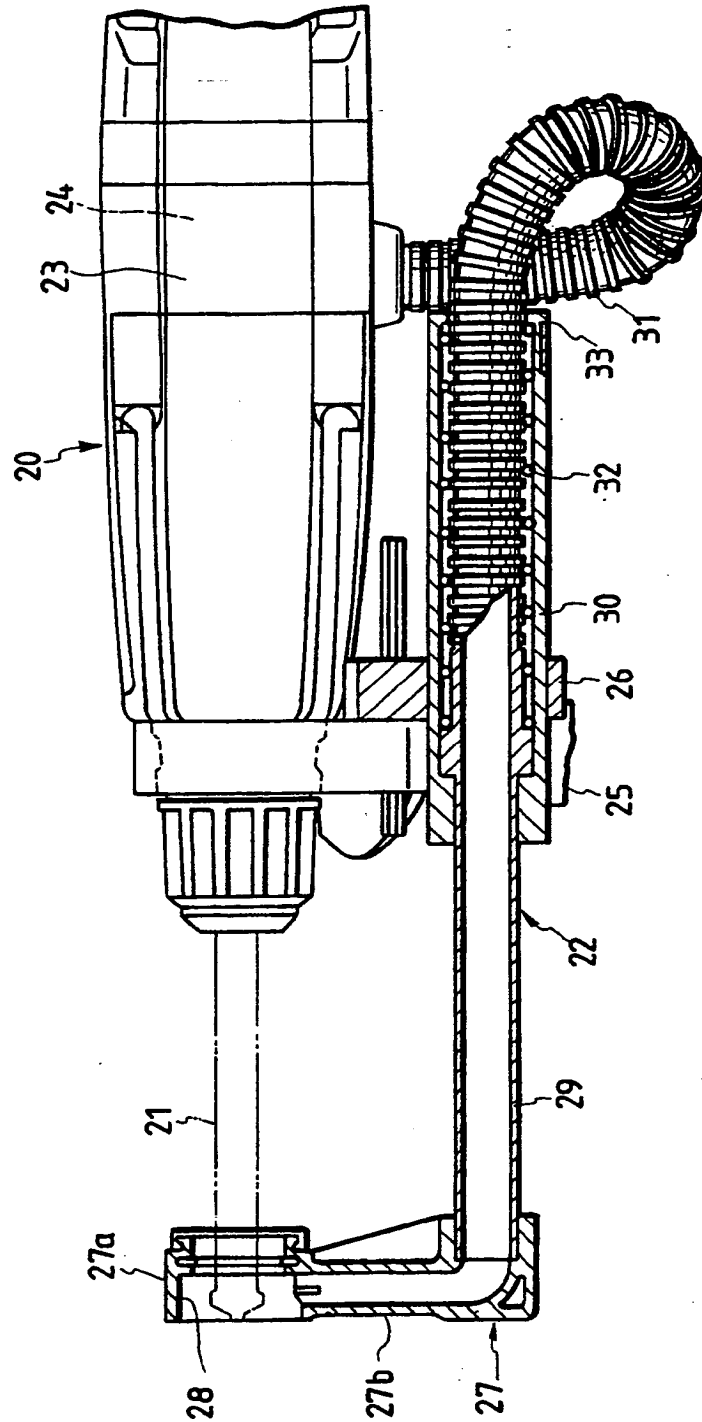
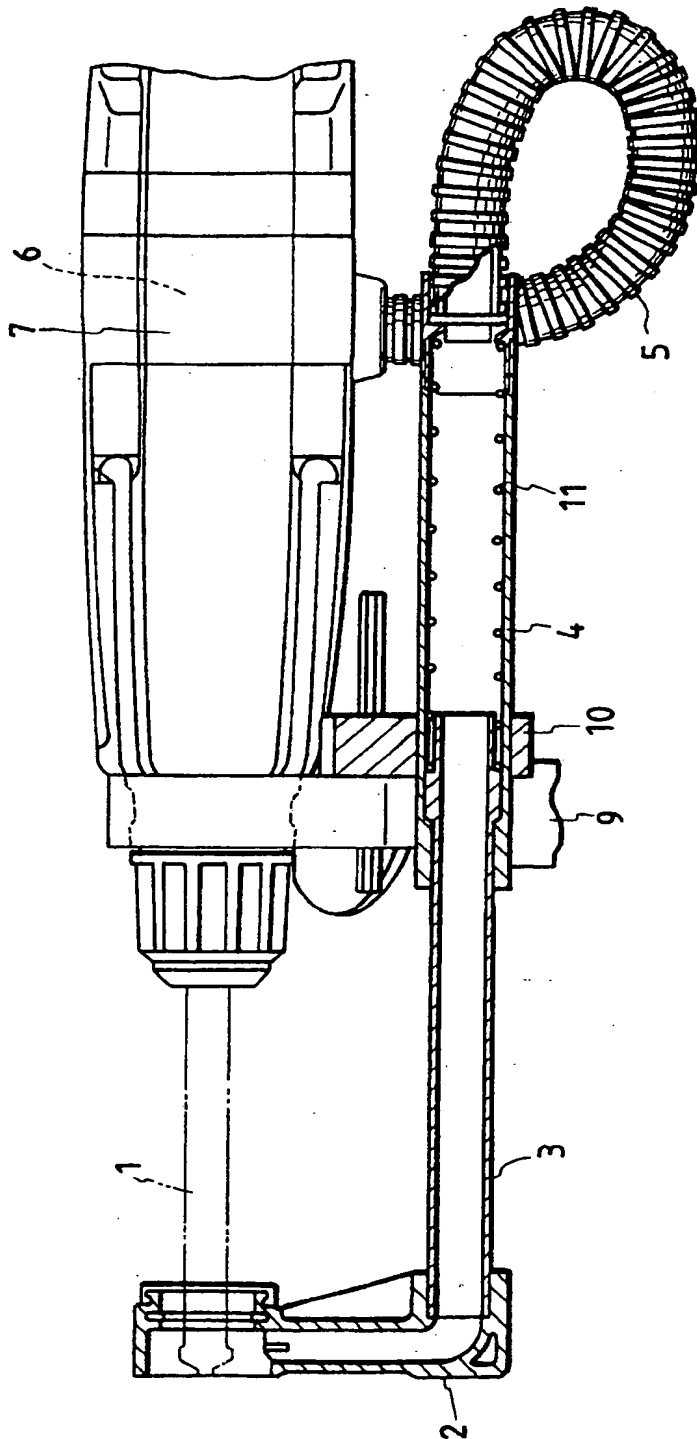


FIG. 3
PRIOR ART





European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1236

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|---|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| X | FR-A-2'329 392 (BOSCH) * Figure 2 * | 1-5 | B 23 Q 11/00 |
| A | DE-A-2 705 409 (BOSCH) * Figure 4 * | 1-5 | |
| A | DE-A-2 453 791 (JOHANSSON) * Figures 1,2 * | 1-5 | |
| A | DE-A-3 129 375 (WESTO) * Figure 1 * | 1-5 | |
| A | DE-A-3 605 204 (FISCHER) * Figures 1,2 * | 1-5 | |
| A | DE-A-2 705 410 (BOSCH) * Figures 1-4 * | 1-5 | |
| A | DE-A-2 940 362 (LICENTIA) * Figure 1 * | 1,2,4,5 | |
| A | FR-A-1 362 495 (LUCAS) * Figures 1,7,8; claim 1 * | 1,2,4,5 | |
| | | | TECHNICAL FIELDS SEARCHED (Int. Cl.5) |
| | | | B 23 Q |
| The present search report has been drawn up for all claims | | | |
| Place of search The Hague | | Date of completion of search 30 January 91 | Examiner LJUNGBERG R.N. |
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